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Dated 3 September 2003

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25JUL02 E736099-1 010002
P01/7700 0.00-0217274.0

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference — bor.2411.uk.dkf

2. Patent application number *(The Patent Office will fill in this part)* — 0217274.0

25 JUL 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Boreas Consultants Limited
3 Bon Accord Square
Aberdeen
AB11 6DJ

Patents ADP number *(if you know it)* 7867617002

If the applicant is a corporate body, give the country/state of its incorporation — United Kingdom

4. Title of the invention — Pipe liner connector

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Kennedys Patent Agency Limited
Queen's House, Floor 5
19-29 St Vincent Place
Glasgow
G1 2DT

Patents ADP number *(if you know it)* 7947382001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	--
Description	7
Claim(s)	--
Abstract	--
Drawing(s)	1 only

10. If you are also filing any of the following, state how many against each item.

Priority documents	--
Translations of priority documents	--
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	--
Request for preliminary examination and search *(Patents Form 9/77)*	--
Request for substantive examination *(Patents Form 10/77)*	--
Any other documents *(please specify)*	--

11. I/We request the grant of a patent on the basis of this application.

Signature KENNEDYS Date 25 July 2002

12. Name and daytime telephone number of person to contact in the United Kingdom: David Fulton/Neil McKechnie 0141 226 6826

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After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.

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c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.

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Pipe Liner Connector

The present invention relates to apparatus for the connection of pipe liners. In particular, the apparatus provides a connector suitable for use with a liner employed in a vented oil and gas pipeline.

It is known to those skilled in the art that pipelines employed for oil and gas production and within the associated refining and transportation industries can have their lifetimes significantly increased by employing a liner. The liner is incorporated within the pipeline so as to reduce the detrimental effects of corrosion. Such liners are intended to isolate the bulk fluids from the pipe wall but are not intended to be completely impermeable to gases.

The primary restriction on the use of such liners is liner collapse due to pressure build up of gases in the micro-annulus between the liner and the parent pipe. If the differential pressure between the micro-annulus and the flowline become sufficient, the liner may collapse resulting in damage to the liner. In PCT Application WO

02/33298 the authors themselves teach of a vented liner that permits gas to flow from the micro-annulus into the centre of the pipeline assembly so as to reduce the effects of pressure build up. Construction of the pipeline entails the welding together of steel pipe sections to form a required length of pipe. Once the welding is complete the pipe is cleaned internally before the plastic liner is inserted. Normally this is achieved by employing a technique that results in a close fit between the liner and the steel pipe, for example swagelining.

As with any such pipeline specific consideration must be given to the physical engineering and installation of the pipeline with actual operational conditions. It is often problematic to pass a length of liner through a significant number of pipe sections. Therefore it makes practical sense to have a liner section associated with each pipe section, the liner being connected together when the pipe sections are welded.

US Patent 5,566,984 teaches of a cylindrical corrosion barrier for connecting pipe sections that comprise associated liner sections. Such cylindrical corrosion barriers are employed to provide a liquid tight seal at the interface of the pipe sections therefore restricting the flow of fluid across the pipe section interface. However, these cylindrical corrosion barriers are wholly unsuited to be used in conjunction with sections of a vented liner as these would provide a seat for pressure build up of gases and therefore increase the risk of liner collapse.

It is an object of the present of at least one aspect of the present invention to provide a pipe liner connector suitable for connecting vented liner sections that are employed to protect a pipeline from the effects of corrosion.

According to a first aspect of the present invention there is provided a pipe liner connector for use with a pipe having an internal vented liner, the pipe liner connector comprising a substantially cylindrical sleeve having opposed first and second open ends, wherein the first open end comprises a first diametrically increased ring section longitudinally displaced from the opening towards the second open end, said ring section having one or more venting grooves located on the outer surface thereof and extending longitudinally thereon.

Preferably the first open end further includes a first seal located between the first opening and the first ring section and having a diameter intermediate of the cylindrical sleeve and the first ring section.

Most preferably when the pipe line connector is used with a pipe having an internal vented liner the first seal provides a liquid tight connection with the internal surface of the vented liner while the first raised ring engages with the internal surface of the pipe.

Optionally a second diametrically increased ring section, substantially similar to the first ring section, is provided adjacent to the second open end of the cylindrical sleeve.

Preferably the second open end further includes a second seal substantially similar to the first seal.

Preferably the pipe liner connector further comprises a shielding ring located between the first and second ring sections.

Most preferably the shielding ring is heat resistant so as to protect the pipe liner connector from welding or a similar heat inducing processes.

Example embodiments of the present invention will now be described with reference to the following figures:

Figure 1 shows a cross section of a pipe liner connector, in situ with two pipe sections, in accordance with an aspect of the present invention.

Referring to Figure 1 a cross section of a pipe liner connector 1 is presented in conjunction with two pipe sections 2. Each pipe section 2 comprises a vented liner 3 that terminates with a cylindrical recess 4, of a greater internal diameter than that of the vented liner 3 itself. The cylindrical recesses 4 provide a means for locating the pipe liner connector 1 between two pipe sections 2, thereafter being fixed in position by the employment of locking rings 5.

The pipe liner connector 1 comprises a sleeve 6 that is generally in the form of a cylindrical tube having opposed open ends 7 and 8. The outer surface of the sleeve 6 has a diameter that is slightly less than the minimum inner diameter tolerance of the cylindrical

recesses 4 therefore allowing adjacent ends 7 and 8 of the pipe liner connector 1 to be inserted into the vented liners 3.

Starting at either end 7 or 8 of the pipe liner connector 1, and working towards the centre, the outer surface of the sleeve 6 can be seen to comprise a number of elements. Initially there is found a groove 9 suitable for locating a sealing ring 10.

The second element is a raised ring section 11. The raised ring section 11 has an outer diameter that is slightly less than the minimum inner diameter tolerance of the pipe section 2 but has a diameter greater than the maximum inner diameter of the cylindrical recess 4. Therefore, when the pipe liner connector 1 is inserted into the pipe section 2 the raised ring section 11 abuts against the end of the vented liner 3 so preventing the pipe liner connector 1 from accidentally passing into the pipe section 2. In order to prevent a build up of pressure within the micro-annulus between the pipe section 2 and the raised ring section 11 a number of venting grooves 12 are formed longitudinally across the outer surface of the raised ring section 11. In this particular embodiment the venting grooves 12 have a rectangular cross section however a triangular, circular or other suitably shaped cross section may readily be employed. Therefore, since any by-products in the micro annulus are free to continue across the length of the pipe liner connector 1 and onto the vents (not shown) located in the vented liner 3, the risk of liner collapse around the pipe liner connector 1 is significantly reduced.

The final element is a central shielding portion 13. The central shielding portion 13 comprises a shielding ring 14. When the pipe liner connector 1 is located with two pipe sections 2 the shielding ring 14 locates directly below the interface of the pipe sections 2. With the shielding ring 14 so located the pipe sections 2 may be welded together without the substantial heat generated by the welding process damaging either the pipe liner connector 1 or the vented liner 3.

A significant advantage of the pipe liner connector described in the present invention is that it provides a means for allowing pipe sections comprising associated vented liners to be welded together without the welding process damaging either the pipe liner connector or the vented liner. Therefore, by employing the pipe liner connector the construction of pipelines for use in oil and gas production or within the associated refining and transportation industries can be made both more efficient and more cost effective.

The foregoing description of the invention has been presented for purposes of illustration and description and is not intended to be exhaustive or to limit the invention to the precise form disclosed. The described embodiments were chosen and described in order to best explain the principles of the invention and its practical application to thereby enable others skilled in the art to best utilise the invention in various embodiments and with various modifications as are suited to the particular use contemplated. Therefore, further modifications or improvements may be incorporated without

departing from the scope of the invention herein intended.

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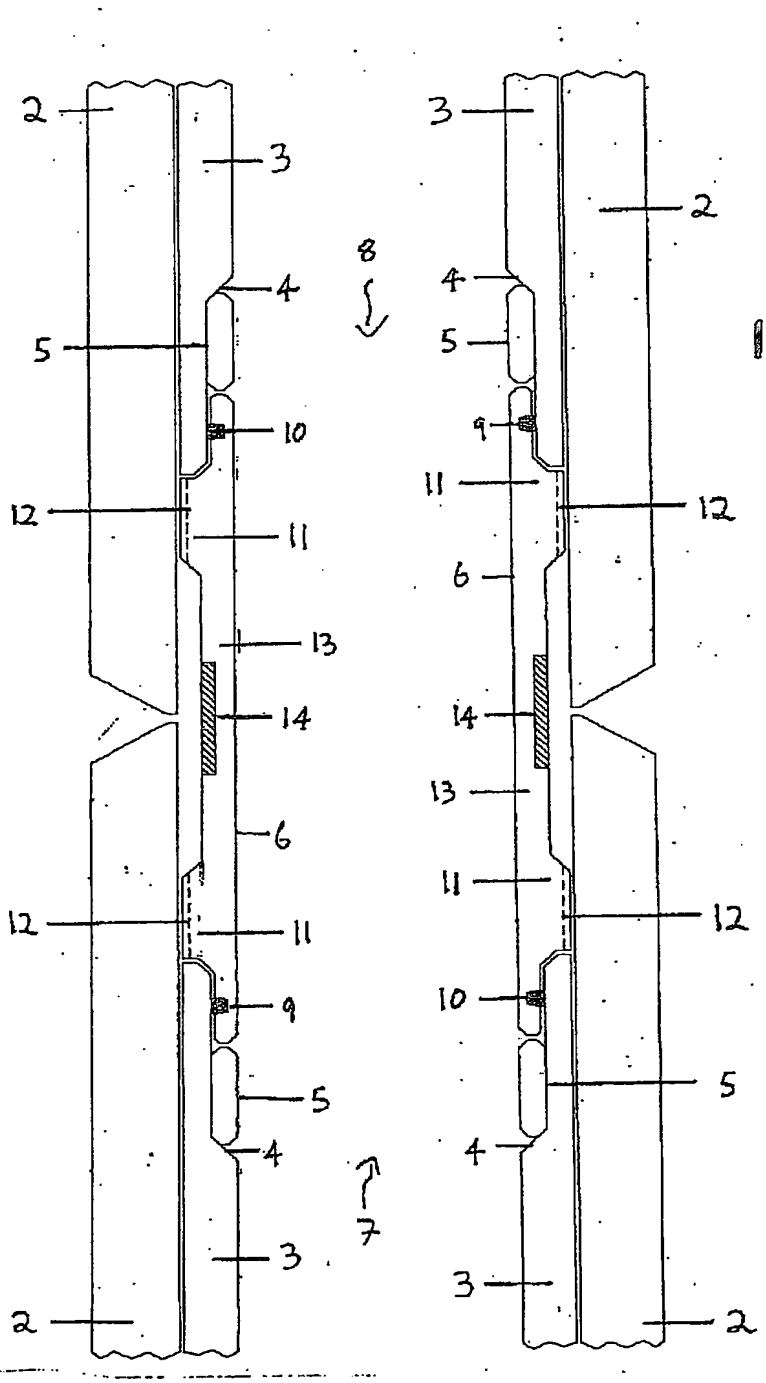

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FIGURE 1